KILBORN ENGINEERING LTD.

CONSULTING ENGINEERS

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CHIEF MECHANICAL ENG.

February 6, 1962.

PLEASE ADDRESS ALL CORRESPONDENCE
TO THE COMPANY AND NOT INDIVIDUALS

36 PARK LAWN ROAD
TORONTO 18, ONT.
CLIFFORD 9-9607

REF: FILE NO.

Mr. W. H. Roxburgh,
Canadian Javelin Ltd.
680 - 5th Avenue,
New York, N.Y.

Dear Mr. Roxburgh:

We enclose herewith 3 copies of our report dated Feb. 2, 1962, covering our Preliminary Estimate of the Capital & Operating Cost for a Mining & Concentrating Plant to produce 3,000,000 Long Tons of Iron Concentrates per year at Julian Lake, Labrador.

All major equipment costs incorporated in this report have been obtained from equipment suppliers.

The labour costs used have been derived from the collective agreement the Iron Ore Company of Canada Ltd. have with the United Steel Workers of America.

We are proceeding with our study of a 540,000 metric ton per year pig iron plant along the lines of that already supplied to Professor H. U. Ross, as per your request.

May we express our sincere appreciation of your request to prepare this report, which we trust provides you with all the necessary information you require at this time. However, not having visited the site, we ask you to consider this report as being of a preliminary nature.

Yours very truly,

KILBORN ENGINEERING LTD.

K. M. Dewar, P. Eng.
President.

KMD/ml.
Encls.

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATE

OF

CAPITAL & OPERATING COST

FOR

A MINING & CONCENTRATING PLANT

TO PRODUCE

3,000,000 LONG TONS OF CONCENTRATES PER YEAR

AT

JULIAN LAKE, LABRADOR

Prepared by:

Kilborn Engineering Ltd.,
Consulting Engineers,
36 Park Lawn Road,
Toronto 18, Ont.

Dated: February 2, 1962.

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED CAPITAL & OPERATING COST

FOR A

MINING, CRUSHING & CONCENTRATING OPERATION

TO PRODUCE

3,000,000 LONG TONS OF IRON CONCENTRATES PER YEAR

INDEX

CANADIAN JAVELIN LTD.

PRELIMINARY CAPITAL & OPERATING COST FOR MINING, CRUSHING & CONCENTRATING

GENERAL DATA FURNISHED BY OWNER

1. 3,000,000 long tons of concentrates are to be produced per year.
2. 2.5 tons of ore are required to produce 1 ton of concentrate.
3. Preliminary pit preparation consists of a relatively small amount of clean-up stripping.
4. 7,500,000 long tons of ore required per year to produce 3,000,000 long tons of concentrates.
5. The mining rate is based on three shifts per day, 250 days per year operation.

$$\frac{7,500,000}{250} = 30,000 \text{ long tons of ore per day.}$$

6. The Concentrator is to be operated three shifts per day, 350 days per year -

$$\frac{7,500,000}{350} = 21,400 \text{ long tons of ore per day.}$$

CANADIAN JAVELIN LTD.

ASSUMED PIT OPERATING DATA ON WHICH THE ESTIMATED CAPITAL & OPERATING COSTS ARE BASED

1. The pit will be operated 3 shifts per day, 5 days per week, 250 days per year. The production rate will be 30,000 long tons of ore per day.

2. The average effective working time per shift is 6½ hrs. During this period, the equipment will operate at 85% capacity.

3. The average production rate for a 6 cu.yd. electric shovel is 600 tons per hour.

   Shovel shifts required - $\frac{30,000}{600 \times .85 \times 6.5}$ = 9 shifts.

   The number of shovels required 3
   With an availability of 75%, the number of shovels required will ultimately be 5

   1 - 2½ yard diesel shovel will be provided for clean up work, to be supplemented later as required.

4. A 60-ton Tractor Trailer will haul 150 tons per hour. The Tractor Trailer shifts required will be

   $\frac{30,000}{150 \times 6.5 \times .85}$ = 36 shifts

   The number of Tractor Trailers required 12

   With an availability of 70%, the number of Tractor Trailers ultimately will be 18

5. At Quebec Cartier (Lac Jeannine) a Quarrymaster QM5-DHD500 (2 - 200 H.P. Electric Motors) using a 9" bit has been averaging 280 ft. per 10 hour shift drilling holes to an average depth of 55 ft. Spacing of holes is 27' x 31' giving about 70 long tons per ft. of hole. Making allowance for sub-drilling and lost time, we have estimated that at Canadian Javelin this machine will average 175' per shift.

Assumed Pit Operating Data, etc. (Cont'd)

5. (Cont'd)

Tons produced per shift = 175 x 70 = 12,250

Drill shifts required per day = $\frac{30,000}{12,250}$ = 2.4 say 3 shifts

Drills required = 1

We have provided for 2 drills,
1 Electric and 1 Diesel 2

We have also provided for 1 small
drilling unit for miscellaneous work 1

6. Bulldozers

No. of Bulldozers required initially 3

Allowing 1 Bulldozer per large shovel,
will ultimately require 5 Bulldozers

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED CAPITAL COST FOR MINING, CRUSHING & CONCENTRATING TO PRODUCE 3,000,000 LONG TONS IRON CONCENTRATES PER YEAR

SUMMARY

1.	**MINING**		
	1. Pit Preparation & Roads	$385,000.00	
	2. Initial Pit Equipment	3,947,900.00	$4,332,900.00
2.	**CRUSHING, GRINDING & CONCENTRATING**		
	1. Primary Crusher		
	A. Building	$ 305,000.00	
	B. Equipment	972,000.00	1,277,000.00
	2. No. 3 Conveyor		
	A. Building	394,000.00	
	B. Equipment	1,023,000.00	1,417,000.00
	3. Ore Storage		
	A. Building	707,000.00	
	B. Equipment	783,000.00	1,490,000.00
	4. Concentrator		
	A. Building	1,344,000.00	
	B. Equipment	5,241,000.00	6,585,000.00
	5. Loadout Area		
	A. Building	583,000.00	
	B. Equipment	190,000.00	773,000.00
	6. Boiler House		
	A. Building	41,000.00	
	B. Equipment	143,000.00	184,000.00

2. CRUSHING, GRINDING & CONCENTRATION (Cont'd)

7.	Shops & Stores			
	A. Building	$ 677,000.00		
	B. Equipment	528,000.00	$1,205,000.00	
8.	Garage			
	A. Building	545,000.00		
	B. Equipment	121,000.00	666,000.00	
9.	Administration Office		250,000.00	
10.	Assay Office		60,000.00	
11.	Substation & General Distribution		250,000.00	
12.	Water Supply Including Tank, etc.		300,000.00	
13.	Oil Tanks & Distribution Lines		120,000.00	
14.	Heating Distribution Lines		100,000.00	
15.	Tailings Disposal		65,000.00	
16.	R.R.Tracks & Sidings Inside Plant Area		200,000.00	
17.	Roads & Yards Inside Plant Area		150,000.00	
	Total			$15,092,000.00
	Overhead, Insurance, Engineering Design, Supervision, etc.			2,308,000.00
	Total for Crushing, Concentrating & Auxiliary Services			$17,400,000.00
	No. 1 Mining (brought forward from Page 4)			$ 4,332,900.00
	TOTAL FOR MINING & CONCENTRATING			$21,732,900.00

(See Page 6 for Explanation of Items Below)

18.	Sprinklers	$ 275,000.00	
19.	Living Accommodation at Plant	367,500.00	
20.	Subdivision at Wabush	4,000,000.00	
21.	R.R.Track from Wabush Line	2,200,000.00	
22.	Road from Wabush Townsite to Plant	1,250,000.00	
23.	Power Line from Wabush to Plant	400,000.00	
	Total Items No. 18 to No. 23		$8,492,500.00
	TOTAL ESTIMATED PLANT AND SERVICES EXPENDITURES		$30,225,400.00

Consideration of the following items is a matter of policy to be established by the client and could have considerable bearing on overall capital and indirect operating cost of project.

18. Sprinklers

All surface structures covered under Mining & Concentrating are of a fire resistant type of construction and no sprinkler costs were included in the main estimate. However, general experience shows that the reduction in fire insurance premiums for a sprinklered risk as against a non-sprinklered risk will pay for the cost of the sprinkler installation in from 2 to 5 years.

Cost of Sprinklers for Plant	$ 275,000.00

19. Living Accommodation at Plant

If the main living accommodation is planned as a subdivision at Wabush, a basic minimum of accommodation will have to be provided at the Plant. Minimum recommended accommodation will be,-

1. A 60-man bunkhouse	$90,000.00	
2. A 100-man cafeteria	120,000.00	
3. Six staff houses for supervisory maintenance personnel	157,500.00	367,500.00

20. Subdivision at Wabush

If the main living accommodation is constructed at Wabush this will require a subdivision of at least 200 dwellings, which together with services, etc. would entail an expenditure of at least 4,000,000.00

21. R.R.Track from Wabush Line

The service track from the Wabush Line to the plant would be from 10 to 11 miles long and would cost about 2,200,000.00

22. Roadway from Wabush Townsite

The service roadway from Wabush Townsite would be about 24 miles and would cost approx. 1,250,000.00

23. Power Line from Wabush to Plant

An electric power line would be necessary from the Wabush power line to the plant and would cost approx. 400,000.00

The Total Cost of these Items is Estimated at $8,492,500.00

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED CAPITAL COST OF PIT PREPARATION AND INITIAL PIT EQUIPMENT REQUIREMENTS TO MINE 7,500,000 LONG TONS OF ORE PER YEAR

DETAILS

1. **MINING**

(1)	Pit Preparation & Roads	$ 350,000.00	
	Contingencies	35,000.00	$ 385,000.00
(2)	Initial Pit Equipment		
	3 - 6 cu.yd. electric shovels	975,000.00	
	1 - 2½ cu.yd. diesel shovel	125,000.00	
	1 - Quarrymaster Drill (QM5-DHD500) electric	175,000.00	
	1 - Quarrymaster Drill (QM5-DHD500) diesel	167,000.00	
	Miscellaneous drilling equipment for the above 2 units	25,000.00	
	1 - Gardner-Denver Air-Trac or equivalent, including miscellaneous drilling equipment	25,000.00	
	3 - D-8 Caterpillar Tractors or equivalent	165,000.00	
	2 - 600 CFM portable compressors	45,000.00	
	6 - Jack hammers & miscellaneous drilling equipment for same	9,000.00	
	2 - Road graders	66,000.00	
	1 - Rubber mounted crane	80,000.00	
	12 - 60 ton Trucks	1,470,000.00	
	1 - 5-ton Panel Truck	10,000.00	
	1 - 3-1/2 ton service truck	5,000.00	
	1 - Truck for transporting men	4,000.00	
	6 - 1-ton pick-up trucks	18,000.00	
	Pit Pumps & Piping	10,000.00	
	Electric power & lighting around pit	80,000.00	
	Pit change house & office	75,000.00	
	Oil storage, explosive storage & miscellaneous small buildings	35,000.00	
	Miscellaneous small tools & equipment	25,000.00	
	Contingencies	358,900.00	
	Total for Initial Equipment		$3,947,900.00
	TOTAL PIT PREPARATION & INITIAL EQUIPMENT COST		$4,332,900.00

CANADIAN JAVELIN LTD.

PRELIMINARY CAPITAL COST ESTIMATE
FOR
CRUSHING, GRINDING & CONCENTRATING PLANT
TO PRODUCE
3,000,000 LONG TONS OF IRON CONCENTRATES PER YEAR

DETAILS

2. CRUSHING, GRINDING & CONCENTRATION

(1) Primary Crushing

A. Building

Excavation & Preparing site	$ 6,000.00	
Backfill	16,000.00	
Concrete	92,200.00	
Structural steel	109,300.00	
Sidewalls	22,000.00	
Roof deck & roofing	12,000.00	
Doors & windows	5,000.00	
Lighting	6,500.00	
Finishing & Misc.	8,000.00	
Contingencies	28,000.00	
Total for 'A' Building		$ 305,000.00

B. Equipment

1 - all steel ore slip	75,000.00
1 - 84"x 48' heavy duty apron feeder with stationary grizzly	150,000.00
1 - 66" x 84" Jaw Crusher complete with lubricating system, motor & drive	265,000.00
1 - 40 ton service crane	40,000.00
1 - slip heater	5,000.00
1 - 60" dribble belt 40' lg.	7,000.00
1 - 60" pick-up belt 90' lg.	16,000.00
Dust control	20,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(1) Primary Crushing

B. Equipment (Cont'd)

Cooling water system (inside building)	6,000.00	
Water supply & piping	10,000.00	
Spares for Jaw Crusher	60,000.00	
Chutes & spouts	15,000.00	
Electrical & controls	45,000.00	
Installation	172,000.00	
Contingencies	86,000.00	
Total for 'B' Equipment		$ 972,000.00
Total for 'A' & 'B' Building & Equipment		$1,277,000.00

Note: One Jaw Crusher only recommended for initial installation. The arrangement should provide for the installation of a second complete unit at a later date.

(2) No. 3 Conveyor

A 54" belt conveyor approx. 4000' long between Crushing Plant and ore storage bin.

A. Building

Excavation & preparing site	8,000.00	
Backfill	3,000.00	
Concrete	14,400.00	
Structural steel	223,200.00	
Sidewalls & roofing	90,000.00	
Doors & windows	3,000.00	
Lighting	10,000.00	
Finishing & Misc.	6,000.00	
Contingencies	36,400.00	
Total for 'A' Building		394,000.00

B. Equipment

1 - 54" cable belt conveyor approx. 4,000' lg. complete with drive, idlers, belting & supporting steel	665,000.00	
Electrical & controls	25,000.00	
Installation	240,000.00	
Contingencies	93,000.00	
Total for 'B' Equipment		1,023,000.00
Total for 'A' & 'B' Building & Equipment		$1,417,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(3) Ore Storage

Covered section 380' x 140' approx. 80' high,
Emergency open section, conveyor gallery & concrete pad only.

A. Building

Excavation & preparing site	8,000.00	
Backfill	9,000.00	
Concrete	332,000.00	
Structural steel	211,500.00	
Sidewalls & roofing	60,000.00	
Lighting	10,000.00	
Finishing & Misc.	12,000.00	
Contingencies	64,500.00	
Total for 'A' Building		707,000.00

B. Equipment

1 - 54" shuttle conveyor approx. 340' lg. including carriage	68,000.00	
12 - 48" x 72" Feeders complete	48,000.00	
3 - 54" conveyor belts approx. 300' lg.	150,000.00	
Dust control	30,000.00	
Bulldozers	85,000.00	
1 - 54" pick-up belt approx. 500' lg.	85,000.00	
Electrical & controls	46,000.00	
Installation	200,000.00	
Contingencies	71,000.00	
Total for 'B' Equipment		783,000.00

Total for 'A' & 'B' Building & Equipment $1,490,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(4) Concentrator

Building approx. 60' x 200' and 120' x 320' including switch room, conveyor gallery from ore storage to Concentrator Bldg. Laboratory, etc.

A. Building

Excavation & preparing site	5,000.00	
Backfill	15,000.00	
Concrete	327,000.00	
Structural steel	457,200.00	
Sidewalls	125,000.00	
Roof Deck & roofing	89,000.00	
Doors & windows	35,000.00	
Lighting	48,000.00	
Heating & ventilating	45,000.00	
Finishing & Misc.	80,000.00	
Contingencies	122,000.00	
Total for 'A' Building		1,344,000.00

B. Equipment

Grinding Area

3 - 22'x 7' Hardinge type Cascade Mills, complete with motors, drives & auxiliary equipment	1,100,000.00	
Oversize return belts 3 - 40'lg. $1200.00) 3 - 60'lg. 2400.00) 3 - 50'lg. 2000.00)	5,600.00	
Pumps, Pump Boxes & Launders	12,000.00	
3 - 8'x 16' scalping screens	21,000.00	
18 - 4'x 7' screens, including drives, etc.	72,000.00	
Chutes	10,000.00	
Pipes & piping	25,000.00	
1 - 40 ton service crane	60,000.00	
Electrical & controls	110,000.00	
Installation	374,400.00	
Contingencies	179,000.00	
Total for Grinding Area		1,969,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(4) Concentrator

B. Equipment (Cont'd)

Spiral Separator Area

768 Rougher Spirals including auxiliaries	620,000.00	
432 Cleaner spirals including auxiliaries	350,000.00	
Pumps & Pump Boxes	35,000.00	
Mill water tanks	30,000.00	
Wash water pumps, etc.	15,000.00	
36 - 24" cyclones	54,000.00	
Chutes & Launders	25,000.00	
Pipes & piping	35,000.00	
Electrical & controls	30,000.00	
Installation	350,000.00	
Contingencies	154,000.00	
Total for Spiral Separator Area		1,698,000.00

Filtering & Drying Area

3 - 24" cyclones	5,000.00	
3 - 15' horizontal type filters, complete with auxiliaries, etc	145,000.00	
3 - 8'6" x 80' Ruggles Cole type dryers, complete with drives, burners, cyclones, fans, etc.	480,000.00	
Pumps & pump boxes	12,000.00	
Chutes & launders	18,000.00	
Pipes & piping	22,000.00	
Electrical & controls	60,000.00	
Installation	185,000.00	
Contingencies	93,000.00	
Total for Filtering & Drying Area		1,020,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(4) Concentrator

B. Equipment (Cont'd)

Miscellaneous

Service Piping	80,000.00	
Laboratory equipment	25,000.00	
3 - Heat Exchanger Units	35,000.00	
Change & Washroom Equipment	28,000.00	
Office Furnishings	10,000.00	
Plumbing	16,000.00	
Drainage & sewers	20,000.00	
Vacuum lines	12,000.00	
Instrumentation	120,000.00	
Sampling & Misc.	20,000.00	
Electrical & controls	36,000.00	
Installation	100,000.00	
Contingencies	50,000.00	
Total for Miscellaneous		554,000.00
Total for 'B' Equipment		5,241,000.00
Total for 'A' & 'B' Building & Equipment		6,585,000.00

(5) Loadout Area

consisting of silos, conveyors, etc.

A. Building

Excavation & preparing site	6,000.00	
Backfill	8,000.00	
Concrete	332,000.00	
Structural steel	91,000.00	
Sidewalls	42,000.00	
Roof deck & roofing	16,000.00	
Windows & doors	6,000.00	
Lighting	3,000.00	
Heating	18,000.00	
Finishing & Misc.	8,000.00	
Contingencies	53,000.00	
Total for 'A' Building		583,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(5) Loadout Area (Cont'd)

B. Equipment

1 - 30" Conveyor belt approx. 560' lg.	45,000.00	
2 - 30" shuttle conveyors approx. 80' lg.	30,000.00	
Gates & chutes	24,000.00	
Dust Control	20,000.00	
Electrical & controls	12,000.00	
Installation	41,000.00	
Contingencies	18,000.00	
Total for 'B' Equipment		190,000.00
Total for 'A' & 'B' Building & Equipment		$773,000.00

(6) Boiler House

A. Building

Excavation & preparing site	1,000.00	
Backfill	1,200.00	
Concrete	9,000.00	
Structural steel	10,000.00	
Sidewalls	5,000.00	
Roof deck & roofing	3,000.00	
Doors & Windows	1,800.00	
Heating & Ventilating	3,500.00	
Finishing & Misc.	1,500.00	
Lighting	1,500.00	
Contingencies	3,500.00	
Total for 'A' Building		41,000.00

B. Equipment

3 - 350 H.P. Boilers compl.	45,000.00	
Breaching, stacks, etc.	10,000.00	
Pump & Misc.	4,000.00	
Oil Tanks & Piping	12,000.00	
Piping	15,000.00	
Electrical & controls	8,000.00	
Installation	36,000.00	
Contingencies	13,000.00	
Total for 'B' Equipment		143,000.00
Total for 'A' & 'B' Building & Equipment		$ 184,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(7) Shops & Stores

A. Building

Excavation & Preparing site	3,000.00	
Backfill	6,000.00	
Concrete	85,000.00	
Structural steel	230,000.00	
Sidewalls	56,000.00	
Roof deck & roofing	60,000.00	
Doors & windows	75,000.00	
Lighting	40,000.00	
Finishing & Misc.	60,000.00	
Contingencies	62,000.00	
Total for 'A' Building		677,000.00

B. Equipment

Machine, Electric, Blacksmith & Carpenter Shops equipment	220,000.00	
Shelves & furnishing	40,000.00	
Heating & ventilating	30,000.00	
Plumbing	16,000.00	
Service cranes	28,000.00	
Electrical & controls	44,000.00	
Installation	102,000.00	
Contingencies	48,000.00	
Total for 'B' Equipment		528,000.00
Total for 'A' & 'B' Building & Equipment		1,205,000.00

(8) Garage

A. Building

Excavation & preparing site	2,500.00	
Backfill	5,000.00	
Concrete	75,000.00	
Structural steel	170,000.00	
Sidewalls	43,000.00	
Roof deck & roofing	45,000.00	
Doors & windows	100,000.00	
Lighting	30,000.00	
Finishing & Misc.	25,000.00	
Contingencies	49,500.00	
Total for 'A' Building		545,000.00

2. CRUSHING, GRINDING & CONCENTRATION

(8) Garage (Cont'd)

B. Equipment

Service cranes	$ 26,000.00	
Jacks, hoists & misc.	10,000.00	
Benches & small tools	20,000.00	
Compressor & misc.	25,000.000	
Electrical & controls	8,000.00	
Installation	21,000.00	
Contingencies	11,000.00	
Total for 'B' Equipment		121,000.00
Total for 'A' & 'B' Building & Equipment		$ 666,000.00
(9) Administration Office		250,000.00
(10) Assay Office		60,000.00
(11) Substation & General Distribution		250,000.00
(12) Water Supply including Tank, etc.		300,000.00
(13) Oil Tanks & Distribution Lines		170,000.00
(14) Heating Distribution Lines		100,000.00
(15) Tailings Disposal		65,000.00
(16) R.R. Tracks & Sidings inside Plant Area		200,000.00
(17) Roads & Yards inside Plant Area		150,000.00
Total		$15,092,000.00
Overhead, Insurance, Engineering Design, Supervision, etc.		2,308,000.00
Total for Crushing, Grinding, Concentration & Auxiliary Services		$17,400,000.00

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED OPERATING COST FOR MINING & CONCENTRATION TO PRODUCE 3,000,000 LONG TONS PER YEAR OF IRON CONCENTRATE FROM 7,500,000 LONG TONS OF ORE

SUMMARY

	Cost Per Ton of Ore	Total
1. MINING		
1. Operating Costs & Supplies	$0.317	
2. Supervision & Supplies	0.091	
3. Power	0.0035	
Contingencies	0.0412	
Total Mining		$0.4527
2. CONCENTRATING		
1. Operating Labour	0.124	
2. Supervision	0.072	
3. Power	0.033	
4. Supplies	0.200	
5. Heating	0.064	
6. Maintenance	0.023	
Contingencies	0.0516	
Total Concentrating		$0.5676
Total Mining & Concentrating		$1.0203

Cost per ton of Concentrate @ 2.5 to 1

1.0203 x 2.5 = $2.55 per ton

CANADIAN JAVELIN LTD.

PRELIMINARY ESTIMATED OPERATING COSTS
TO MINE
7,500,000 LONG TONS OF ORE PER YEAR

30,000 Long Tons of Ore Per Day of
3 shifts, 250 Days Per Year.

	Per Day	
1. Operating Labour	Labour	Supplies
1 - Pit Superintendent @ $15,000/yr.	$ 60.00	
3 - Pit Foremen @ $10,000/year	120.00	
3 - Shift Bosses @ $7,500/year	90.00	
1 - Blasting Foreman @ $7,500/year	30.00	
2 - Powdermen @ $2.75/hr.	44.00	
Explosives & Blasting supplies		$1,000.00
9 - 6 cu.yd. shovel shifts @ $11.00/hr.		792.00
2 - 2½ cu.yd. shovel shifts @ $6.00/hr.		96.00
11 - Shovel operators @ $3.25/hr.	286.00	
11 - Shovel oilers @ $2.45/hr.	215.60	
3 - Quarrymaster Drill shifts, 24 hour operation, including bits & rods @ $40.00/hr.		960.00
1 - Air Trac Drill shift @ $15.00/hr.		120.00
4 - Drillers @ $2.85/hr.	91.20	
4 - Drillers helpers @ $2.45/hr.	78.40	
36 - 60-ton truck shifts @ $8.00/hr.		2,304.00
36 - Truck drivers @ $2.80/hr.	806.40	
1 - Fuel truck shift		5.00
1 - Fuel truck operator @ $2.60/hr.	20.80	
1 - Service truck		5.00
1 - Service truck operator @ $2.60/hr.	20.80	
6 - ½ ton pick-up trucks		30.00
1 - Man transportation truck		5.00
9 - Bulldozer shifts @ $4.00/hr.		288.00
9 - Bulldozer operator shifts @ $2.75/hr.	198.00	
4 - Grader shifts @ $4.00/hr.		128.00
4 - Grader operator shifts @ $2.75/hr.	88.00	
2 - Rubber mounted crane shifts @ $4.00/hr.		64.00
2 - Rubber mounted crane operator shifts @ $2.90/hr.	46.40	
3 - Portable compressor shifts @ $2.00/hr.		48.00
15 - Man shifts for miscellaneous pit jobs, scaling, block, holing, etc. $ $2.50/hr.	300.00	
Total Wages	$2,495.60	
Fringe Benefits 15%	374.14	
Total Labour	2,869.74	2,869.74
Daily Mining Costs		$8,714.74
Miscellaneous		871.47
Total Daily Mining Costs		$9,586.21
Cost Per Ton of Ore Mined		$0.317

2. Supervision

	Per Day	
(1) Staff	Labour	Supplies
1 - Manager @ $25,000/hr.	100.00	
1 - General Superintendent @ $18,000/yr.	72.00	
1 - Mechanical Supt. @ $10,000/yr.	40.00	
1 - Electrical Supt. @ $10,000/yr.	40.00	
1 - Chief Engineer @ $10.000/yr.	40.00	
1 - Chief Accountant @ $9,000/yr.	36.00	
1 - Purchasing & Stores @ $7,500/yr.	30.00	
1 - Shop Foreman @ $7,500/yr.	30.00	
1 - Garage Foreman @ $7,500/yr.	30.00	
1 - Surface Boss @ $7,000/yr.	28.00	
3 - Warehouse Clerks @ $450./month	64.80	
5 - Office Clerks @ $450/month	108.00	
5 - Office Clerks @ $350/month	84.00	
2 - Draftsmen @ $500/month	48.00	
3 - Survey Geologists @ $600/month	86.40	
1 - Engineering Office Clerk @ $450/month	21.60	
Office Supplies		60.00
(2) Shops		
4 - Machinists @ $3.00/hr.	96.00	
6 - Mechanic-Riggers @ $2.95/hr.	141.60	
6 - Mechanics #2 @ $2.80/hr.	134.40	
1 - Welder Leader @ $2.90/hr.	23.20	
10 - Welders @ $2.75/hr.	220.00	
6 - Electricians @ $3.00/hr.	144.00	
6 - Electricians helpers @ $2.75/hr.	132.00	
4 - Carpenters @ $2.80/hr.	89.60	
2 - Painters @ $2.70/hr.	43.20	
2 - Blacksmiths @ $2.95/hr.	47.20	
4 - Drill Repair & Bit Sharpener @ $2.80/hr.	89.60	
12 - Labourers @ $2.20/hr.	211.20	
1 - Shop Clerk @ $2.00/hr.	16.00	
Expendable shop supplies, tools, etc.		275.00
Total Labour	2,246.80	335.00
Total Labour & Supplies		
Mine Portion 50%	$1,123.40	$167.50

	Per Day Labour	Per Day Supplies
3. Garage		
3 - Automotive mechanics leaders @ $3.15/hr.	75.60	
6 - Automotive mechanics "A" @ $3.00/hr.	144.00	
6 - Automotive mechanics "B" @ $2.90/hr.	139.20	
6 - Automotive mechanics "C" @ $2.75/hr.	132.00	
3 - Dry & First Aid men @ $2.20/hr.	52.80	
3 - Watchmen (truck) @ $2.20/hr.	52.80	
4 - Labourers @ $2.20/hr.	70.40	
1 - Shop clerk @ $2.00/hr.	16.00	
Garage supplies		150.00
Heating Mine Dry & Office, also diesel oil requirements for pit		100.00
	682.50	250.00
Brought Forward from Items 1 & 2	1,123.40	167.50
Daily Labour	1,806.20	417.50
Fringe Benefits	270.93	
	2,077.13	2,077.13
Daily Labour & Supplies		2,494.63
Miscellaneous		249.46
Total Daily Labour & Supplies		$2,744.09
Cost Per Ton of Ore Mined		$0.091

4. Power	Installed H.P.	H.P.H.
3 - Electric shovels @ 19 hrs. per day installed 664 maxim. usage 500 H.P.	1500	28,500
1 - Quarry Master 400 H.P. @ 19 hrs. per day	400	7,600
Mine lighting, etc.	40	600
	1940	36,700

Demand Load 80% - say 30,000 H.P.H.

Power Cost 3.5 mills per H.P.H. = $105.00 per day

Cost Per Ton of Ore Mined - $ 0.0035

Total Cost Per Ton of Ore Mines = $ 0.4115

PRELIMINARY ESTIMATED OPERATING COST FOR CRUSHING, GRINDING & CONCENTRATION TO PRODUCE 3,000,000 LONG TONS OF DRIED IRON CONCENTRATES PER YEAR

Operating 3 shifts per day for 350 days at 21,400 Long Tons per day.

1. Operating Labour	No. of Men Per Shift	No. of Men Per Day	Total Cost
Primary crusher operator	1	3	
Primary crusher operator helpers & belt attendants q	1	3	
Dumpers	1	3	
Surge bin bulldozer operators	3	9	
Cascade Mill operator (Foreman)	1	3	
Cascade Mill operators	3	9	
Spiral Separator operators	3	9	
Filter Operator	1	3	
Dryer Operator	1	3	
Dryer operator helper	1	3	
Sample & sample handling	1	3	
Compressor & vacuum pump men	1	3	
Belt conveyor attendant	1	3	
Loadout men	1	3	
Loadout man, helpers	2	6	
Boiler house attendant	1	3	
Labourers		21	
Total Number of Men		90	

20 additional operators required for a 40 hr. week -

Total Operators required is - 110 men

Hourly rates will range from $2.20 to $3.30 per hour and averaging - $2.85 per hour.

90 x $2.85 x 8 = $2,051.00

Cost per ton of ore milled	$0.096	
Fringe Benefits	0.015	
Miscellaneous	0.013	$0.124

Fringe Benefits are made up as follows:

Workmen's Compensation	5.25%
Silicons	1.25
Vacation Pay	3.00
Legal Holidays	2.00
Unemployment insurance	0.50
Medical Plan	1.00
Insurance Plan	0.50
Miscellaneous	1.50
	15.00%

2. Supervision

	Cost Per Day
50% of staff & shop personnel & supplies $1,290.90/day on 250 day year. This is equivalent to $922.07 on a 350 day year	$ 922.07
1 - Mill Superintendent @ $12,000/yr.	34.29
1 - Assistant Mill Supt. @ $10,000/yr.	28.58
1 - Metallurgist @ $10,000/yr.	28.58
4 - Mill Foremen @ $7,500/yr.	85.72
1 - Chemist @ $7,500/yr.	21.43
4 - Technicians @ $6,000/yr.	68.70
4 - Technician Helpers @ $5,000/yr.	57.25
	$1,246.62

Cost per ton of ore milled $0.058
Fringe Benefits & Misc. 0.014

Total Supervision $0.072

3. Power

	Installed H.P.	H.P.H. Per Day
Primary Crushing	570	9,771
Conveying to storage	250	4,286
Feeder belts, etc.	220	5,280
Autogenous grinding area	3,948	94,752
Spiral separator area	150	3,600
Filter & drying area	1,950	46,800
Miscellaneous (Concentrator)	300	7,200
Loadout area	100	2,400
Shops	400	9,600
Garage	100	2,400
Water supply	2,000	48,000
Miscellaneous (plant area)	500	12,000
	10,488	246,089

Demand Load 80% - 196,871 - say 200,000 H.P.H.

Power cost at this location will be approx. 3.5 mills per H.P.H.

Total Cost Per Day - $700.00

Cost Per Ton of Ore Milled @ 21,400 tons per day - $0.033

4. Supplies

A. Steel Consumption

1.5 lbs. per ton @ 10¢ per lb. $0.15

B. Miscellaneous

Filter cloth, screen cloth & miscellaneous, assume 0.05

Total - $0.20

5. Crude Oil

For heating - average - 4300 Gallons per day.

For drying - average - 7200 Gallons per day.

Total 11,500 Gallons per day.

Cost per Gallon $0.120

Cost per day $1,380.00

Cost per ton of ore $0.064

6. Maintenance

4% of the estimated capital cost

of buildings = $172,000.00

Per Ton $0.023

CANADIAN JAVELIN LTD.

ESTIMATED H.P. REQUIREMENTS

1. **Mining**

Shovels 664 x 3	2092	
Quarry Master 400	400	
Misc. lighting, etc.	40	2,532 H.P.

Note:
Installed H.P. in shovels is as follows:

Motor generator set	150 H.P.
Cab motor blower	7.5 H.P.
Crowd motor blower	1.5 H.P.
Hoist motor	300 H.P.
Propel motor	80 H.P.
2 swing motors 37.5	75 H.P.
Crowd motor	50 H.P.
	664.0 H.P.

The maximum usage at any one time will be approx. 500 H.P./shovel

2. **Crushing, Grinding & Concentration & Auxiliary Screens**

(1) **Primary Crushing**

Jaw Crusher	400	
Apron feeder	40	
Service crane	60	
Belt conveyors	30	
Dust control	25	
Miscellaneous & lighting	15	570 H.P.

(2) **Conveyor No. 3**
Crushing Plant to ore storage 250 H.P.

(3) **Ore Storage**

Shuttle belt	50	
Feeders	30	
Pickup belts	90	
Dust control & lighting	50	220 H.P.

(4) **Concentrator**

1. **Autogenous Grinding Area**

3 - 22'x 7' Cascade Mills	3,750	
Pumps	60	
Screens	60	
Return belts	18	
Service crane	60	3,948 H.P.

Estimated H.P. Requirements (Cont'd)

2. Crushing, Grinding & Concentration & Auxiliary Screens

4. Concentrator (Cont'd)

(2) Spiral Separator Area		
Pumps & Misc.		150 H.P.
(3) Filtering & Drying Area		
3 - 15' horizontal filters including auxiliaries	900 H.P.	
3 - 8'6" x 80' Ruggles Cole type of dryer	750	
Pumps & Miscellaneous	300	1,950 H.P.
(4) Miscellaneous		300 H.P.
Total for (4) Concentrator		6,348 H.P.

5. Loadout

30" Belt Conveyor	40 H.P.	
Shuttle belts	30	
Dust Control & Misc.	30	100 H.P.

6. Shops	400 H.P.
7. Garage	100 H.P.
8. Water Supply	2,000 H.P.
9. Miscellaneous including lighting	500 H.P.
Total for Crushing, Grinding, Concentrator & Auxiliary Services	10,448 H.P.
Total for Mining & Concentrator Plant	13,020 H.P.

Demand Load 80% - 10,416 H.P. say 10,000 H.P.

Install one 8,000 K.W. Substation.

CANADIAN JAVELIN LTD.

GENERAL SPECIFICATIONS & DESCRIPTION OF MINING EQUIPMENT

AND

SURFACE PLANT

1. Mining Equipment

The equipment covered by this report is the basic minimum necessary to start operations. Additional shovels, trucks, etc. will be required as the pit operations expand.

The only buildings included are a Pit Change House and Office, Powder Magazine and miscellaneous tool sheds, etc.

The Pit Change House and Office will be a structural steel frame building on concrete foundations, with insulated panel walls, insulated panel pitch roof and with necessary windows, doors, interior partitions, finish, toilet and washroom facilities, lighting, and with necessary heating unit, etc.

Powder Magazine layout to conform with Underwriters requirements.

Pit tool sheds, etc. to be light weight structural steel, metal clad buildings on skids.

Pit lighting to be of the flood light type with necessary permanent and movable towers.

Oil supply at pit to include a small tank for heating plant at Change House and Office, and an emergency supply for compressors and drills only.

2. Crushing, Grinding & Concentrating

(1) Primary Crushing

This will be a structural steel frame building on reinforced concrete foundation and floor system, metal panel walls, Q. deck roof and built up roofing, and with necessary doors, lighting, etc.

The Crusher will be a 66" x 84" Jaw complete with necessary drive, cooling and lubricating systems. The Crusher is the size recommended for use with 60 ton trucks.

The structure includes an all steel ore slip capable of holding between 2 to 3 truck loads of ore and with the necessary apron feeder, solid bar grizzly, spill belt, pickup belt, service crane, etc. No heat supplied to this structure except for operators cabin and ore slip.

One Crusher only to be supplied for initial installation. However, we feel that two Crushers may ultimately be required in order to provide continuous operation over the life of the mine.

2. Crushing, Grinding & Concentrating (Cont'd)

(2) No. 3 Conveyor (Crusher to Ore Storage)

The conveyor recommended to handle the size of ore and tonnages to be expected is a 54" cable belt system, carried on a structural steel metal covered gallery, with pitch roof and necessary bents, supports, lighting, etc. No heat in structure.

Additional capacity can be obtained by speeding up the belt.

(3) Ore Storage

Reinforced concrete tunnels, foundations and floors, structural steel balloon type canopy over the main section to protect ore from adverse weather conditions. Balance of storage to be open and to be used for emergency purposes only, together with the necessary conveyor galleries, with metal covered sides and roof, lighting, etc. Capacity in covered section approx. 80,000 long tons, total approx. 150,000 long tons.

Ore to be distributed via shuttle conveyor and fed as required by pick up belts to Concentrator. All belts to be 54" cable type. No heat in structure.

(4) Concentrator

A structural steel frame structure with insulated metal panel walls. Q. deck insulated roof and built-up roofing carried on a reinforced concrete foundation and with reinforced concrete ground and intermediate floors, together with necessary doors, lighting, heating, etc.

The Concentrating plant, which consists of autogenous grinding mills with necessary auxiliaries, spirals, dryers, etc. will be laid out in three lines of approx. 1,000,000 long tons of concentrate each per line with necessary process water, wash water and hot water supply and handling equipment. The layout also includes filters, vacuum pumps, compressors, instrumentation, sampling, test laboratory, offices, locker room, washroom, etc. This plant is capable of producing 3,000,000 long tons per year of a -35 mesh concentrate containing 65% iron with a moisture content of from 1% to 2%.

The arrangement will be such that expansion can be readily made by adding additional production lines to the west side of structure.

(5) Loadout

The arrangement as shown, includes 12 reinforced concrete silos carried on reinforced concrete supporting walls over loadout tracks and with a structural steel penthouse over structure with insulated metal panel sidewalls, Q. deck insulated built up roof and with the necessary heating, lighting, etc.

2. Crushing, Grinding & Concentrating (Cont'd)

(5) Loadout (Cont'd)

The Concentrates are transported from dryer section of Concentrate Bldg. to loadout structure via a 30" belt conveyor of standard type of construction carried in a structural steel insulated metal covered conveyor gallery.

Due to the free flowing characteristics of the concentrates, loadout from silos is via flexible metal chutes with cut off gates.

The total loadout capacity as shown, is approx. 24,000 long tons or about 2½ days run. Increased capacity can be obtained by constructing additional silos as found necessary. Loadout requirements will be about 100, 90-ton cars per day at full production.

(6) Boiler House

This is a structural steel frame building with an insulated metal panel sidewall, Q. deck insulated built up roof deck, carried on reinforced concrete foundation, and with necessary doors, heating and lighting. This structure is located on the north-east side of the Concentrator building where the greatest heat demand is located.

The heating units supplied are 3 - 350 H.P. Scotch Dry Back type, oil fired, compact boilers, providing steam at 125# pressure, complete with necessary day tanks, oil handling equipment, steam lines, etc.

The use of 3 units lends flexibility to the system as one, two or three units can be utilized as required according to heat demands during the year. Additional units can be installed by extending the building towards the south along the east wall of the Concentrator structure.

(7) Shops & Stores

This is a structural steel frame building with insulated metal panel sidewalls, Q. deck insulated built up roof deck, carried on reinforced concrete foundations and with necessary doors, lighting and heating. This structure will house Machine Shop, Electric, Plate, Carpenter Shop, also Stores Dept. Structure will have necessary partitions, washroom and office facilities and interior finish as required.

The equipment will include lathes, iron workers, forges, drills, hammers, presses, etc. together with necessary service cranes, and be capable of handling all emergency repairs and general maintenance requirements. Enlargement can be made by adding to either end of the structure.

2. Crushing, Grinding & Concentrating (Cont'd)

(8) Garage

This is a structural steel frame building with an insulated metal panel sidewall and roof structure, carried on reinforced concrete wall and floors and with necessary doors, lighting and heating requirements. This structure to be capable of housing all trucks, bulldozers, and to provide facilities for all truck repairs. Building to be divided as required and to be provided with necessary grease pits and service cranes.

The structure may be increased as required by adding to either end of building.

(9) Administration Building

This is a structural steel frame building carried on reinforced concrete sidewalls and with reinforced concrete floors. Structure to be a 2-storey unit with insulated metal sidewalls and Q. deck insulated built up roof.

Interior partitions and finish to be as required.

Building to provide office space for supervisory staff including conference room, toilets, vault, etc. as required and with necessary lighting, heating and ventilating.

(10) Assay Office

This is a one-storey structural steel building with insulated metal sidewalls and roof structure carried on reinforced concrete foundations and with necessary partitions, lighting and heating.

This structure to house sample preparation equipment, Assay equipment, etc.

(11) Substation

An 8,000 K.W. Substation to include necessary transformers, switching structure, on a reinforced concrete base and with necessary protecting fence, etc. The estimate as submitted, covers distribution lines from substation to various control rooms including pit area but does not include cost of transmission line from power source to substation.

(12) Water Supply Including Tank

This system calls for necessary pumps and pump house set on rock filled crib base on Wabush Lake with a 500,000 U.S. gallon tank located on a knoll back of proposed plant site, complete with necessary pipe lines. Requirements are approx. 20,000 U.S. G.P.M.

2. Crushing, Grinding & Concentrating (Cont'd)

(12) Water Supply Including Tank (Cont'd)

The pipe line from pump house to tank will be a surface line.

The line from the tank to the Concentrator will be partially on surface and partially underground. All distribution lines around plant will be carried in pipe trenches along with the steam distribution lines. A fire protection hydrant system is also provided.

(13) Oil Tanks and Oil Distribution

The oil requirements will include gasoline, diesel fuel oil and crude oil. The tank farm will be capable of storing approx. one month's supply. Heating and pumping facilities and distribution lines to be supplied to handle oil to points of usage, except for mine requirements, which will be handled by truck to tanks at mine as required.

(14) Heating & Distributing Lines

All structures except Crushing Plant, Mine Change Room and Office, and ore storage building, to be heated from central heating plant described under Item 6 - Boiler House. All distribution lines will be insulated and carried in pipe trenches along with water lines described under Item 12.

(15) Tailings Disposal

The layout as shown, covers tailings pump and pipe lines as indicated. This line may be run to the low area between Crushing Plant and Concentrator and used to fill in this low area if suitably dyked.

(16) R.R. Tracks & Sidings (inside plant area)

R.R. Tracks and sidings to be provided capable of handling approx. 100 R.R. cars per day, together with facilities for loading and unloading at shop and stores area. Estimate as submitted does not include R.R. track requirements from Wabush line to plantsite.

(17) Roads & Yards inside Plant Area

This item includes general yard area and roadway from Concentrator to mine and covers general grading and crushed rock surfacing only. Estimate as submitted does not include cost of roadway from Wabush townsite to plantsite.

Respectfully submitted,

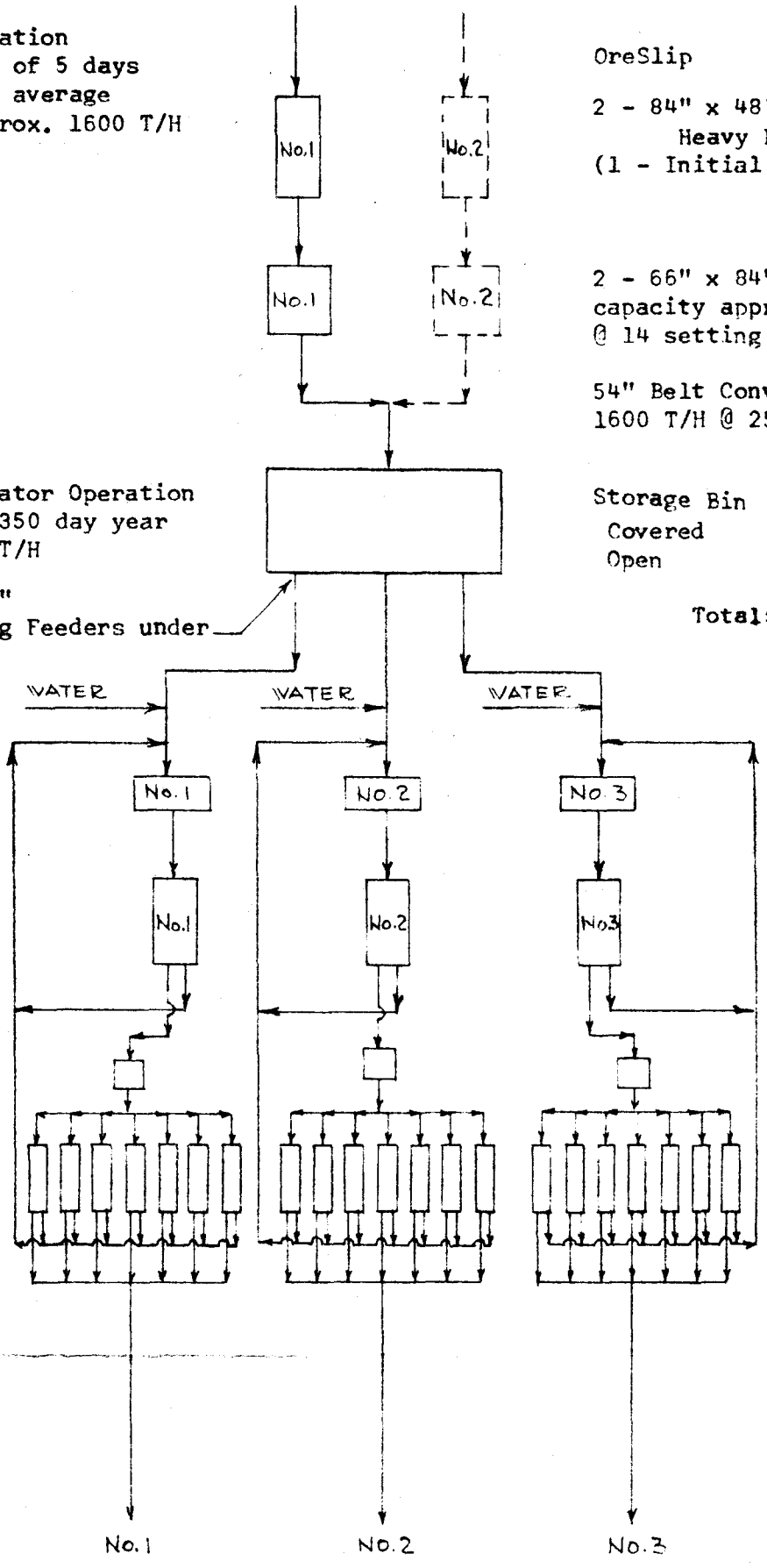
KILBORN ENGINEERING LTD.

K. M. Dewar, P. Eng.
President.

Canadian Javelin Ltd.,
Crushing, Grinding & Concentrator Plant
To Produce
3,000,000 Long Tons of Iron Concentrates Per Year

Proposed Flow Sheet

Pit Operation
3 shifts of 5 days
1250 T/H average
max. approx. 1600 T/H



OreSlip

2 - 84" x 48' Apron Feeders
Heavy Duty
(1 - Initial 1 - Future)

2 - 66" x 84" Jaw Crushers
capacity approx. 1600 Long Tons per hour
@ 14 setting (1 - Initial 1 - Future)

54" Belt Conveyor approx.
1600 T/H @ 250'/M at 78% load.

Concentrator Operation
3 shift 350 day year
904 T/H

36" x 72"
Vibrating Feeders under

Storage Bin	Storage
Covered	80,000 long tons
Open	70,000 long tons
Total:	150,000 long tons

3 - 54" Conveyor Belts

3 - 22' x 7' Cascade Mills
312 T/H each

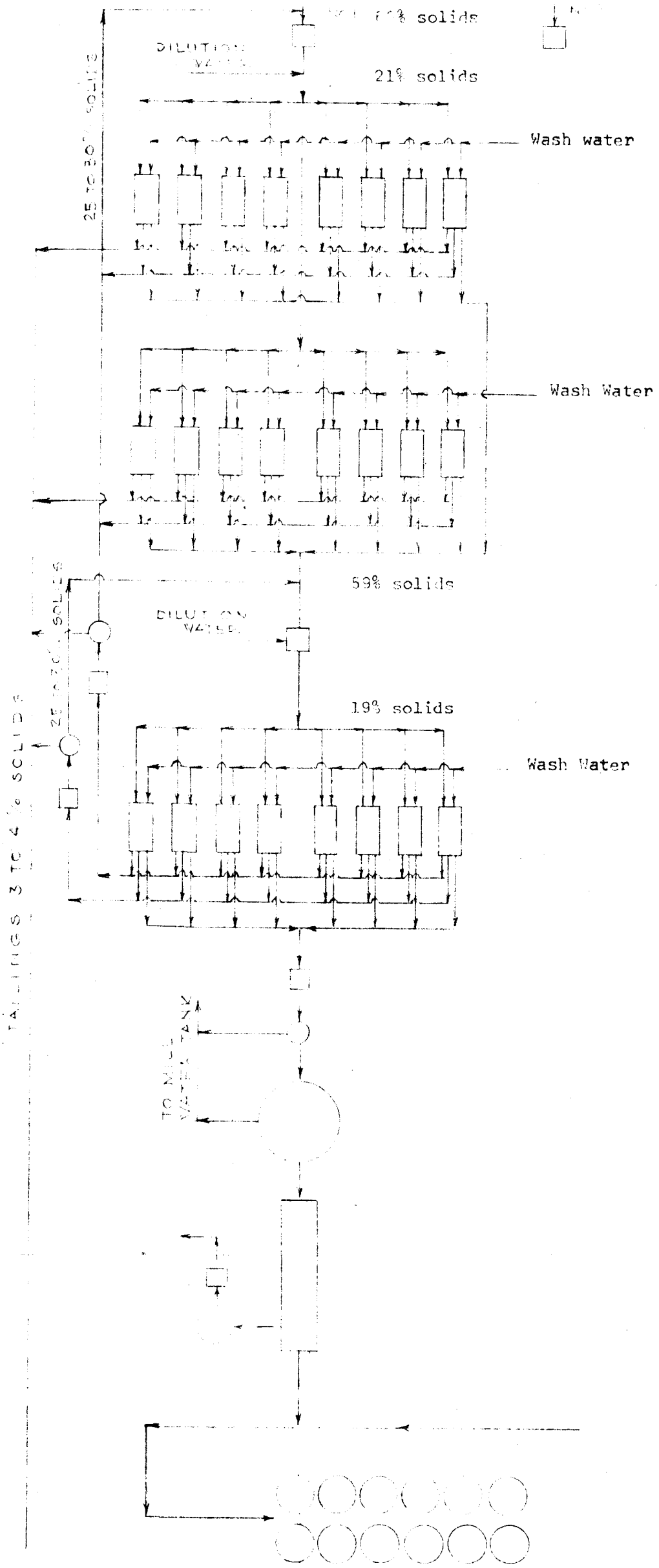
9 - 8' x 16' Splitter
screens with 3/16" mesh

Pump, Pump Box & Splitter Box

24 - 4' x 7' Derrick type screens
18 will normally carry the load
6 spares to allow for screen
mesh charge & breakdown
Speed 3600 R.P.M.

To Pump Boxes

Note:
Water to Cascade Mill will have to be heated for winter operations.



256 rougher spirals per line
Set in 16 banks of 16 spirals each
Approx. 1.2 tons/spiral/hour
768 spirals for the 3 lines
10 G.P.M. of wash water per spiral.
Rubber lined launders & pipes
5 turn spiral 6'4" high.

3 Pumps & Pump Boxes
6 - 24" cyclones at from 15' to 24' head per line 18 in all rejects from cleaner spirals
3 - pumps & pump boxes.

6 - 24" cyclones at from 15' to 24' head per line, 18 small on middlings from cleaner spirals.

144 cleaner spirals per line
set in 8 banks of 18 spirals each
432 spirals for the 3 lines.

3 Pumps & pump boxes

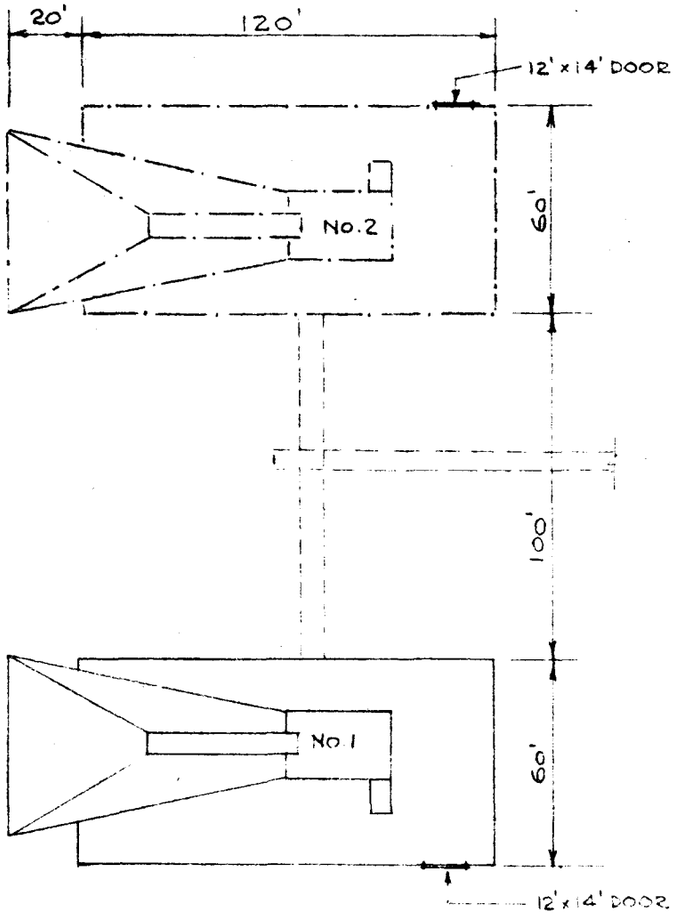
3 - 24" Cyclones

3 - 15' Horizontal Filters
capacity 125 tons/hour each
Moisture content approx. 8%

3 - 16' dia. cyclones
3 - 50,000 CFM Fans
2 - 8'6" x 80' Dryers
Ruggles Cole Type
125 Tons/hour each
Moisture approx. 2%

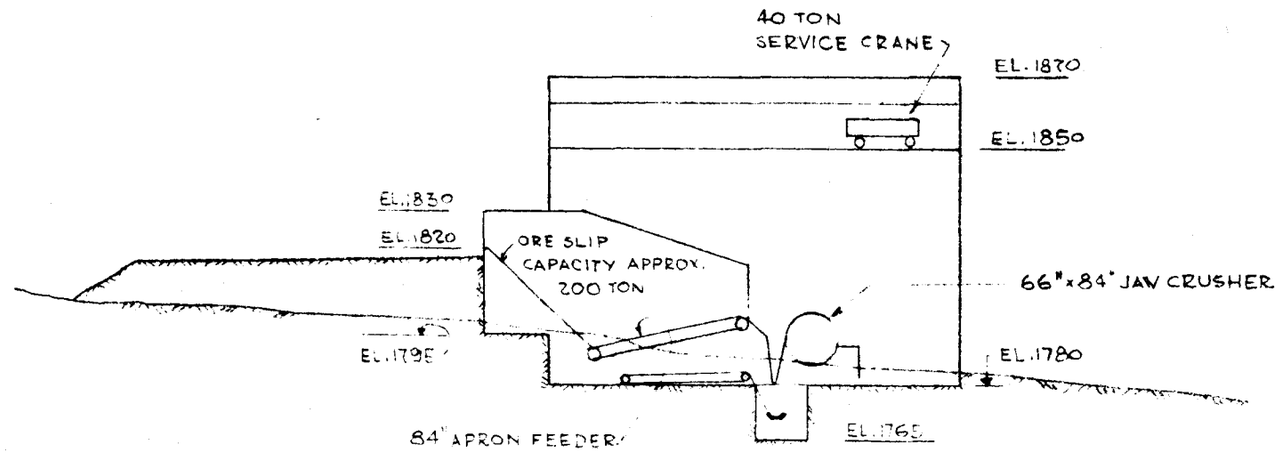
36" Belt Conveyor, 375 tons/hr.
@ 150 ft/M @ 74% loading

12 - 24' x 58' Loadout Bins
capacity 2,000 Long Tons each
24,000 Long Tons Total approx.
2 1/2 days production.

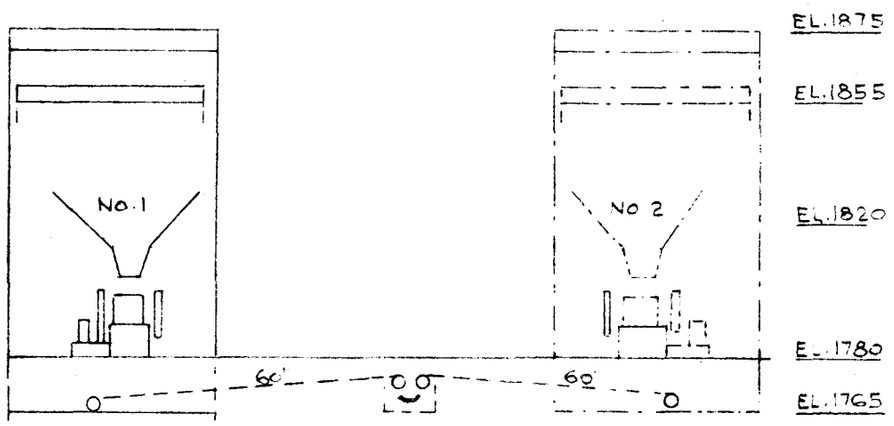


INITIAL INSTALLATION

PLAN



SECTION

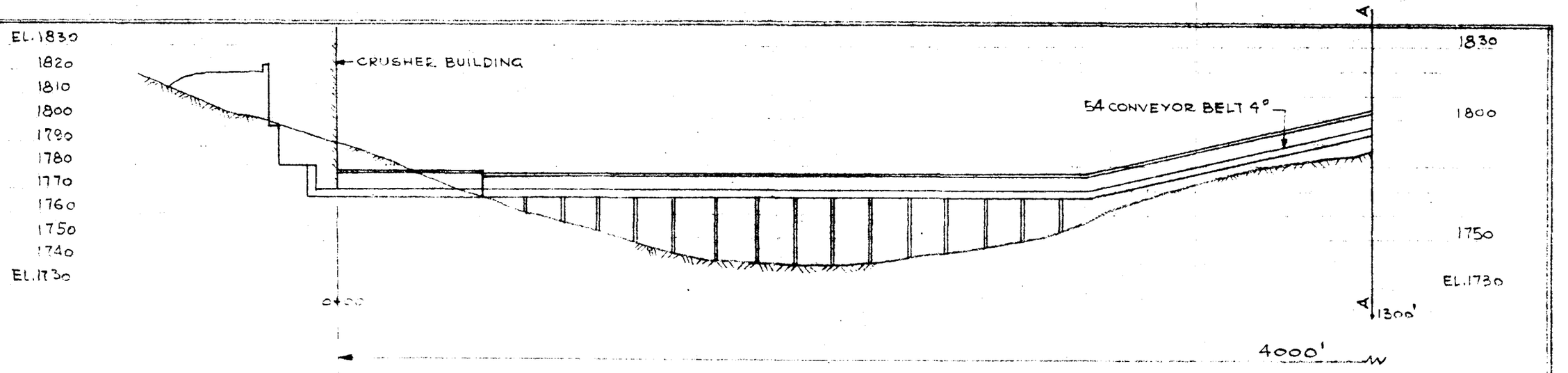


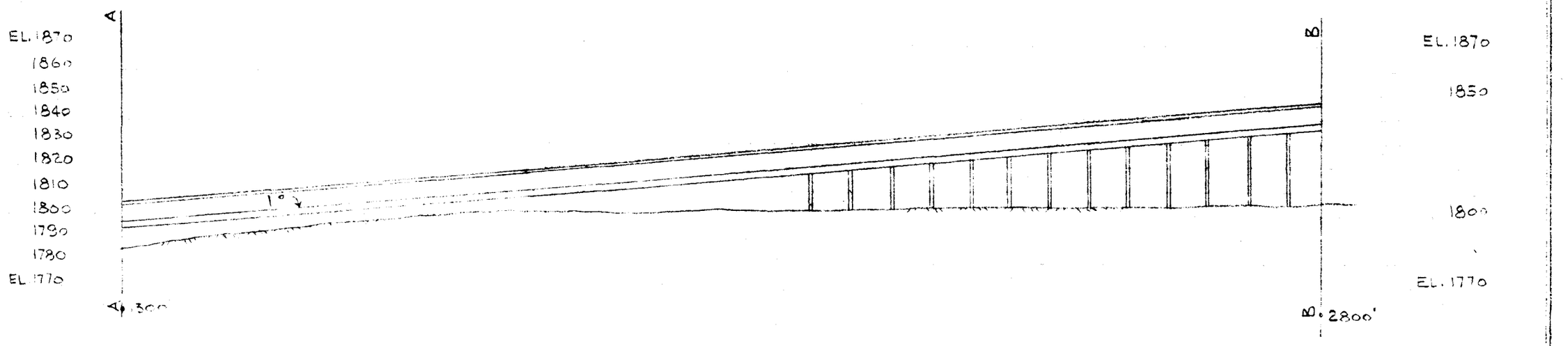
ELEVATION

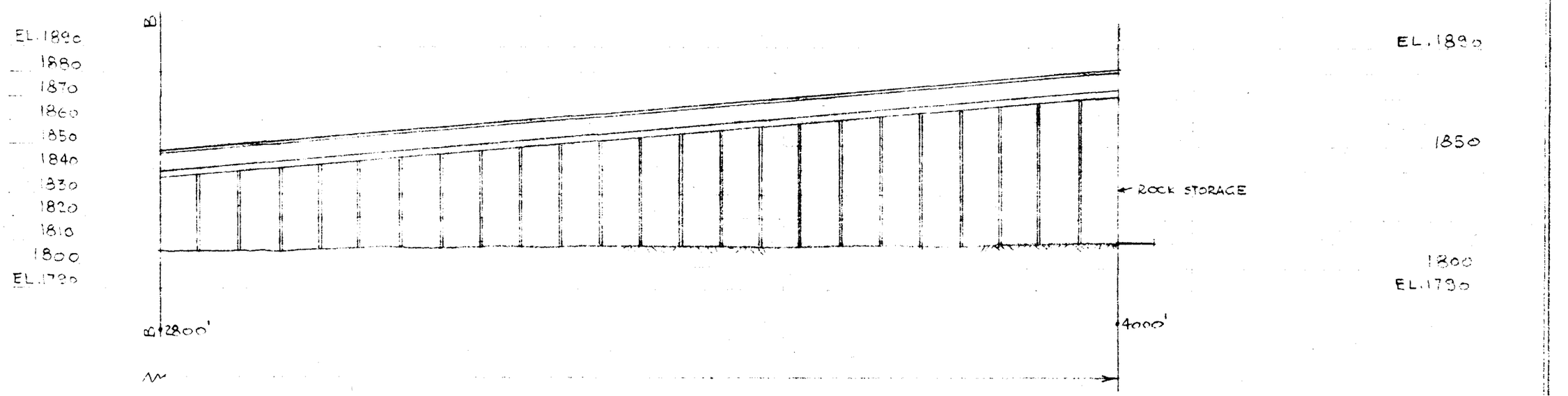
PRIMARY CRUSHER

SCALE: 50' = 1"

SKETCH No.1



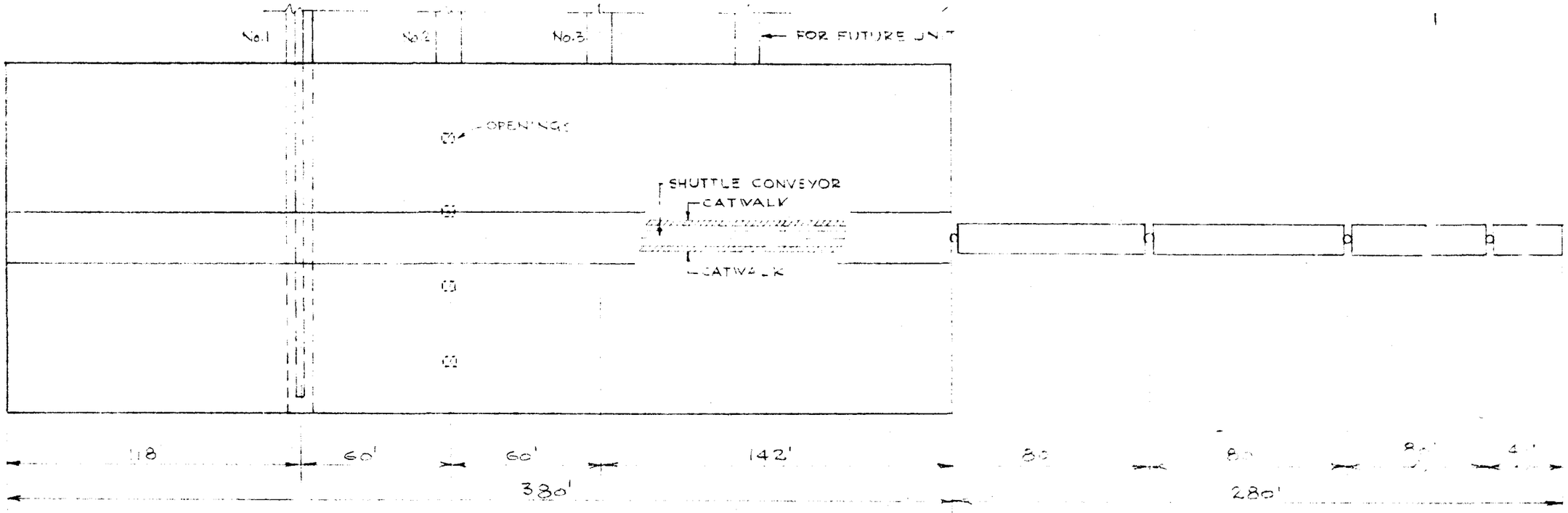




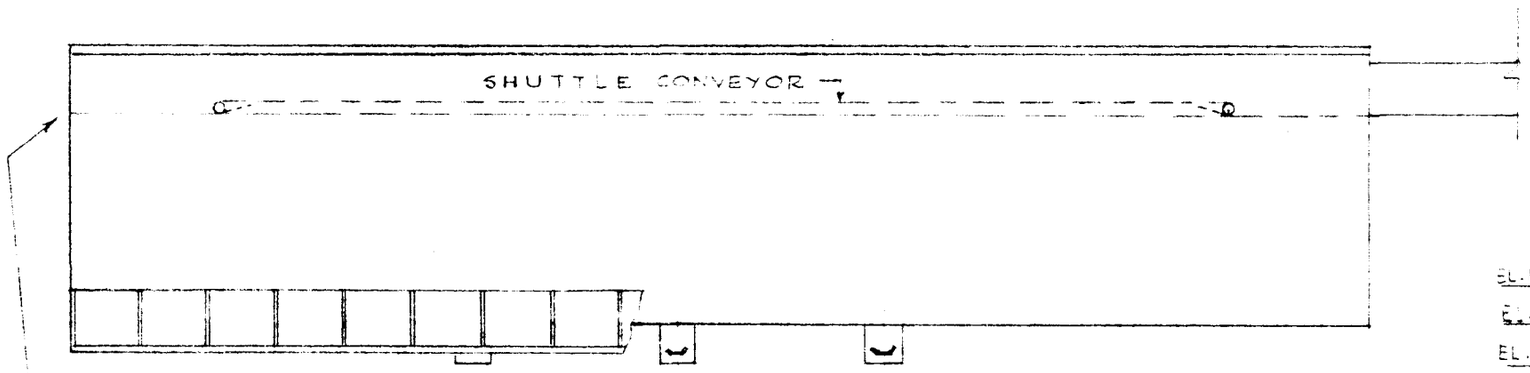
No. 3 CONVEYOR

SCALE: HORIZ. 15'=1", VERT. 50'=1"

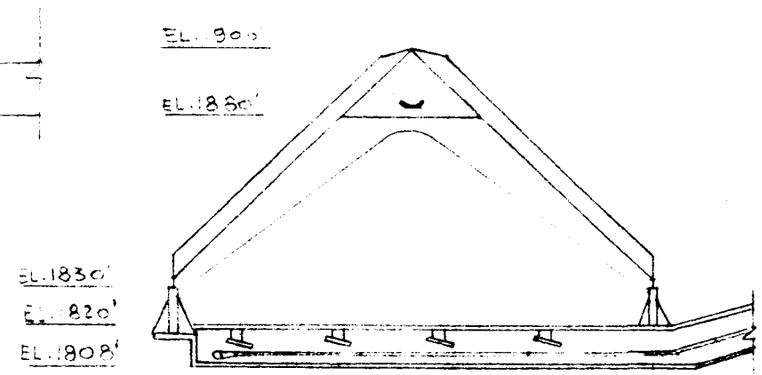
SKETCH No. 2



PLAN



ELEVATION

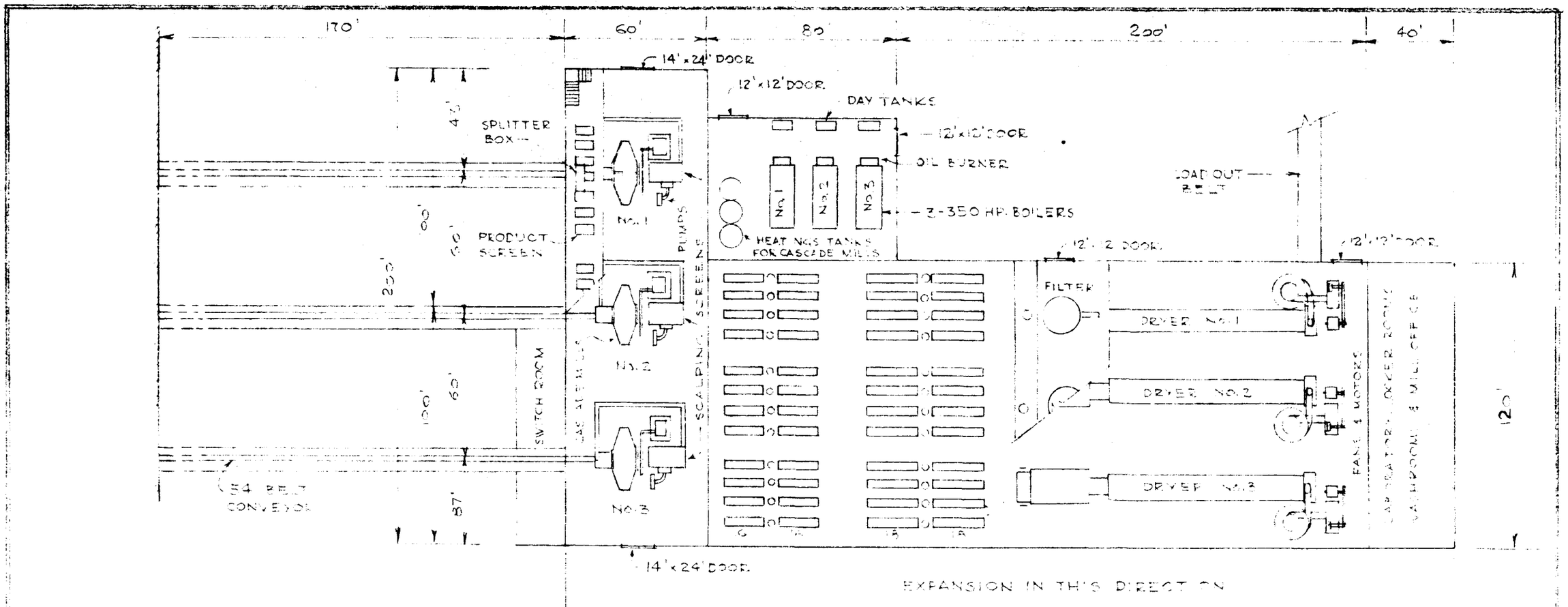


SECTION

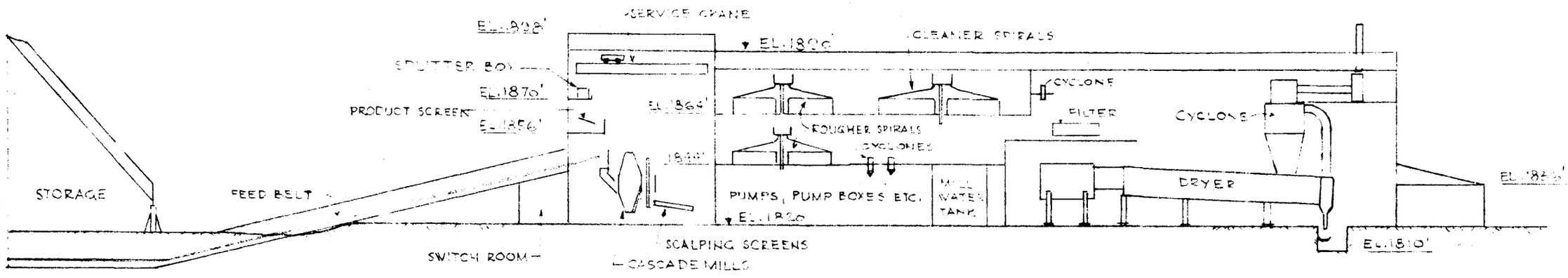
ROCK STORAGE

SCALE: 50' = 1"

SKETCH No. 3



PLAN

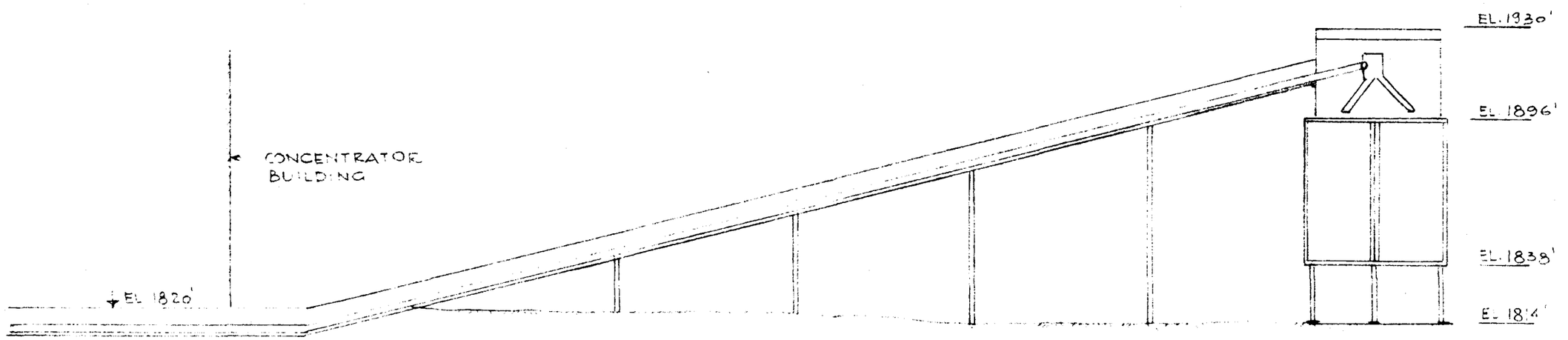


ELEVATION

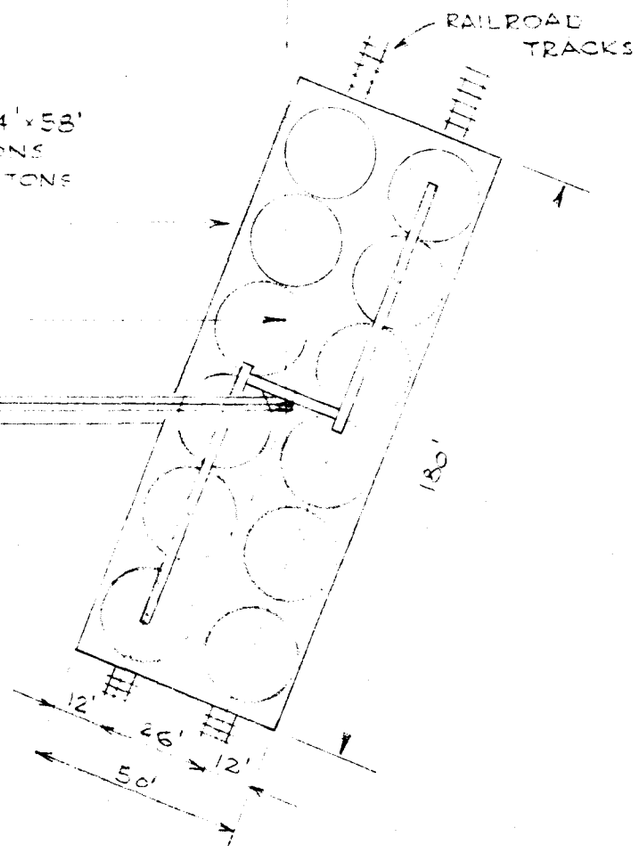
CONCENTRATOR

SCALE: 1" = 50'

SKETCH No 4



ELEVATION

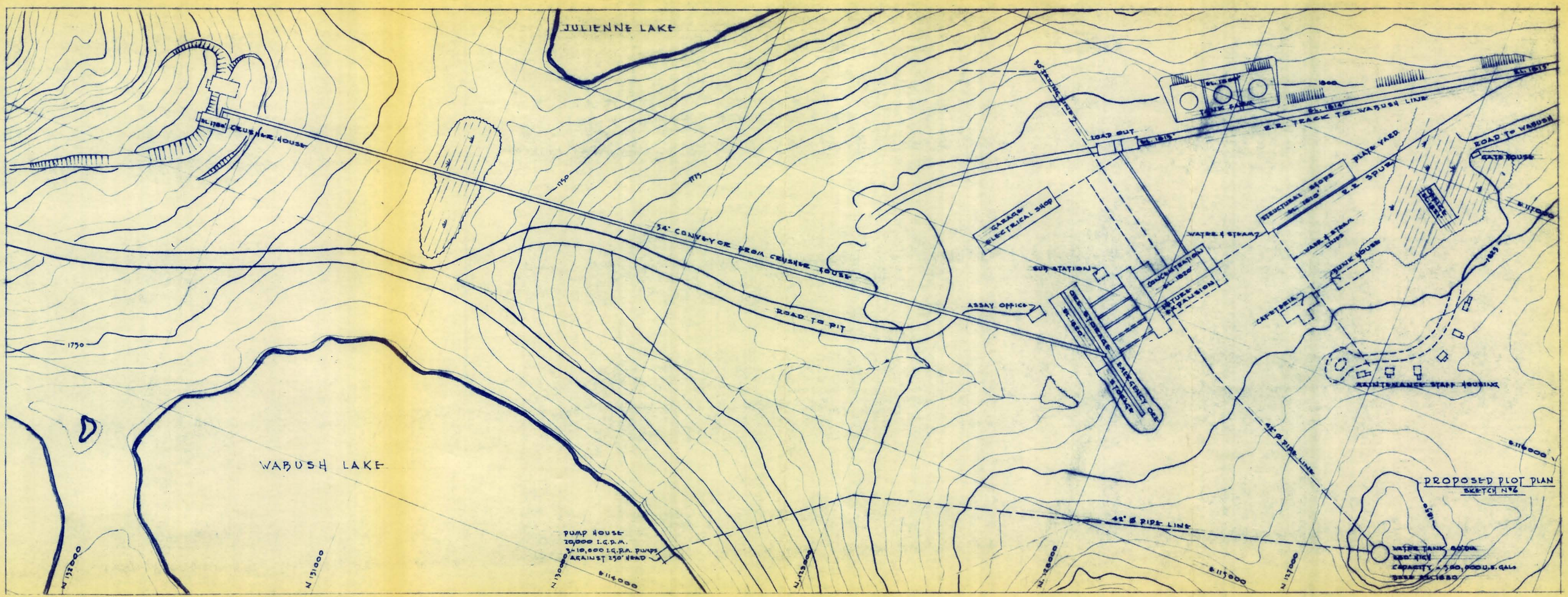


PLAN

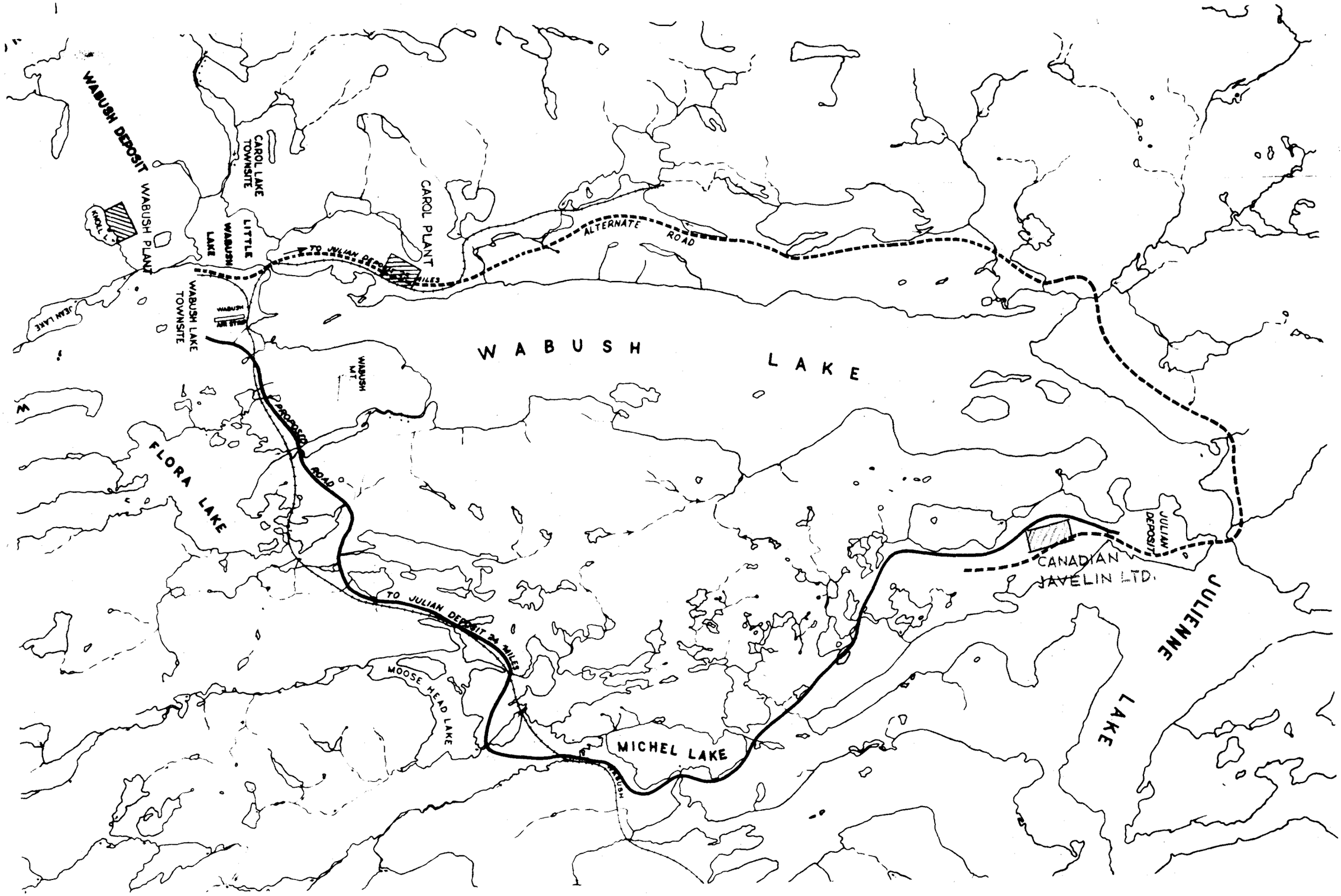
LOADOUT CONVEYOR & BINS

SCALE: 1" = 50'

SKETCH No. 5



PROPOSED PLOT PLAN
SKETCH No 6



GENERAL LOCATION PLAN

SKETCH No. 7